Earth & Environmental Sciences Division

News, Views & EEScience

Disclaimer: this monthly update is intended for internal distribution within the Earth and Environmental Sciences Division at Los Alamos National Laboratory and must not be distributed outside of LANL.

Safety

A Message from Jeff

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EES' Record on Lost Work Days Starts Over

On March 18, 2003, an EES employee was injured severely enough to warrant a restriction in their work duties. This was the first case in 708 days for EES (an excellent record). This incident was only discovered in early August because of a delay in reporting primarily due to the fact that the job supervisor was an employee of RRES and the paper trail became lost inside RRES. We will continue with an excellent past record that we are very proud of and now we begin again.

Reporting Injuries

It is important that your group office be notified of any injury to an employee. We expect all of our employees who are injured or hurt on the job to go to the Occupational Medicine Group, HSR-2. If you are hurt or injured on the job, please remember to notify your group office immediately. Your immediate supervisor is usually enough but this may not be sufficient in every case; therefore, I advise everyone to be sure to follow up and notify your group office.

West Nile Virus Alert

Thanks to FMU-2 (Monique Sanchez, Angela Martinez, and Jacque McClory), for the following information.

Home Mosquito Remedy

Put some water in a white dinner plate and add a couple drops of Lemon Fresh Joy dish detergent. Set the dish on your porch, patio, or other outdoor area. No one is sure what attracts them, the lemon smell, the white plate, or what, but mosquitoes flock to it, and drop dead shortly after drinking the Lemon Fresh Joy/water mixture, and usually within about 10 feet of the plate. Check this out-it works just super! It may seem trivial, but it may help control mosquitoes around your home, especially in the south and elsewhere where the West Nile Virus is reaching epidemic proportions in mosquitoes, birds, and humans. Read more @
FMU77 Home Page http://www.lanl.gov/pfm

No Food and Drinks when Evacuating Structures

Recently, buildings TA-3/215 and 40 had our annual evacuation drill. While this was only a drill, I want to remind everyone of an important issue that was noted by the evaluation team. Several individuals were observed carrying coffee, soda, or drinks, and food during the exercise. This seems like a perfectly innocent thing to do while you are just "practicing" your evacuation route. This is a serious practice in a drill and even more dangerous in an actual evacuation. Carrying drinks and food while walking always creates the potential for spillage and thus creating a slipping hazard for those who follow after you. Therefore, please do not carry any drinks or food with

you during an evacuation drill or in a real emergency evacuation.

Security

An Ear on the LIR from Tony

Tony Montoya, Acting Division Security Officer (DSO), 7-8065, antonio@lanl.gov

Escort Procedure Change

This is to alert you that a new Classified Security LIR Attachment, Attachment 18 (Escorting US Citizens in Security Areas) has just been published and can be located at: http://lln.lanl.gov/lir/lir4060002att18.pdf

Be Aware, Cautious and Alert. Security is your business. The biggest threat to the Laboratory is the **insider threat**. The second biggest threat is **Cyber security**. Be careful of what you throw away. Your receipts, private correspondence, or personal paper work may be trash to you but it can be a prize to someone looking to do personal or financial damage to you or the Laboratory. And finally, remember that your e-mail is not private.

Reminder: Wear your Badge!

During a recent OPSEC (Operations Security) audit of EES Division, auditors observed, and noted for the record, that several EES employees were not wearing their badges. This is a serious **security** issue and we remind you that while on Laboratory property or in Laboratory occupied structures, you must wear your security badge at all times and it must be visible on your person (picture facing out) at all times and worn above the waist. **Security is everyone's responsibility.**

Be very conscientious about protecting your data or information. You should always lock your computer screen when you leave your office, and if possible, close your door as well. Make sure that all sensitive or classified documents are appropriately protected. Shred paper work whenever you have a question about sensitivity. Remember that financial information (budgets, or even your personal receipts from travel) are sensitive. In addition, if you send sensitive data to a shared printer, be sure to pick it up promptly.

Student & Mentor News

Alexis Lavine, EES Student Liaison
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Several students from EES gave excellent presentations at the Los Alamos Symposium 2003. Three students in EES won awards for outstanding student presentations at the Symposium. Congratulations to Siobahn Corish (EES-11), Kari Brown (EES-6), and Susan Stephens (EES-9).

Transitions - A Rock Solid Message from Terry Wallace

On August 11-13 the Laboratory held a strategic planning retreat with all Division Leaders, Directorate Leaders, and the Senior Executive Team. The purpose of this retreat was to refine and focus the vision and goals of the Laboratory. The retreat also served the purpose of examining the impediments to pursuing excellence in science at Los Alamos, and beginning the discussions of breaking down barriers of inter-division and inter-directorate projects. The Los Alamos National Laboratory Mission is National Security. In this context, the three pillars of the mission are:

(1) **Ensure the safety and reliability of the U.S. nuclear deterrent.**

(2) Reduce the threat of weapons of mass destruction, proliferation, and terrorism.

(3) Solve national problems in defense, energy, environment, and infrastructure.

The EES division plays a role in each and every one of the three pillars. At first glance, the "safety and reliability" of nuclear weapons may sound far a field of earth sciences. However, this mission statement includes a commitment of cradle to grave stewardship that includes waste disposal and nuclear test readiness. EES already plays a role in threat reduction; however, I see a rapidly expanding mission for us in forensics and modeling. The final pillar commits Los Alamos to solving problems in energy security. The strategic planning retreat identified four strategies for achieving this:

Strategy 1: Advance the R&D base that will create the nuclear future for the nation.

Strategy 2: Provide R&D for technologies to remove carbon dioxide from the habitable environment.

Strategy 3: Engage in the transformation to a National Hydrogen Economy.

Strategy 4: Lead the National effort to provide the S&T basis to develop a sustainable water future.

The first strategy includes exploring new and creative paths to nuclear waste disposal; the second focuses on the removal and storage of greenhouse gasses; the third reflects our involvement in understanding the role of hydrogen in future energy sources; and the fourth recognizes perhaps our nation's most important resource, water. I strongly believe that the Los Alamos vision and strategies recognize that EES is integral to the Laboratory, and I am excited about future opportunities.

A second aspect of the August retreat was an examination of the Laboratory's values. Although values statements may sound like, "motherhood, nation, and apple pie", the discussion on values is a reflection of our Laboratory culture. The core values are:

- Service to Nation
- Integrity and Openness
- Passion for Excellence and Innovation
- Personal Accountability
- Respect for Others
- Teamwork

These values are pretty good for defining what we should be, and defining our place in the world of science and technology. The first value reflects the fact that we are a National Laboratory, and we have the obligation to work on problems in the interest of society. The value of integrity and openness is an acknowledgement that the Laboratory has not always explained itself to the public, and it affirms that trust is the key element in service to the nation. The last value, teamwork, is extremely important because it is something that sets Los Alamos apart from many science organizations. We work on difficult problems that require timely solutions. The only way to do this is to build teams of disparate expertise. This goal has personal meaning to me; I spent 20 years in academics, which is a wonderful experience in terms of scientific growth, but the reason I came to Los Alamos was the desire to be part of a TEAM that works to solve problems of societal relevance. In my short

time here, I have been struck at the extraordinary teamwork of EES division, and truly believe that we do serve the nation.

My Open Door Policy:

I want to encourage all division members to come by and tell me about successes or frustrations in your jobs. Send me e-mail or make an appointment with Jessica Faulkner (jmfx@lanl.gov), my administrator, or call 7-3644. My Laboratory E-mail is wallacet@lanl.gov, or if you want truly confidential correspondence, please feel free to send me an e-mail at home (tcw@loslamos.com).

Dollar$ and $ense New$

The end of the fiscal year is rapidly approaching and it is appropriate to reflect on the successes and challenges for the Division. In FY03 the division saw its budget grow by nearly 10 percent due to the extraordinary efforts of the staff in program development. I am quite pleased to report that the Division had a major success in assuring nearly full funding for all staff. This is a marked improvement over the situation a few years ago, and speaks to the vitality of our science – everyone is to be congratulated for this achievement.

The next year poses some great challenges as the Laboratory moves to a new pricing model. I realize that there is angst throughout the division about the new financial model, but I have great confidence in the Division Leadership Team (DLT) and the Business Leadership Team to help guide us to a new way of conducting our business. Within every challenge is opportunity, and I believe that we are becoming far more competitive, which will lead us to new projects. The Laboratory vision is:

The trusted, competitive scientific solution for today's and tomorrow's national security challenges.

Service Anniversaries & Congratulations to the Following

Marja Springer, **EES-6, 20 years**
Steen Rasmusssen, **EES-6, 15 years**

Congratulations - Gordon Keating

Gordon Keating, EES-9, was successfully converted from a post-doc to a TSM this month. Gordon is a team member of EES-9's GISLab.

News from the Science and Engineering Leadership Team

Chris Bradley, Chair,
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This is the first month for the new SELT Chair, Chris Bradley (EES-11), to begin reporting for the SELT.

In August, SELT held meetings to review our/TSM's perceived capabilities in this division in preparation for the Division Retreat scheduled for 20 August. This was a productive follow up to our July meeting with the program manager for Yucca Mountain (Ardyth Simmons) and thrust leaders in Carbon, Water, and Weapons Effects.

SELT discussed how the Division capabilities reflected the current thrusts and how changing leadership within the Division has affected the

focus of these capabilities (or the advertised focus).

Several new capabilities within the Division should be recognized and advertised via our web site. These new areas of interest must be defined in terms of precise definitions of whether they are initiatives, thrusts, capabilities, disciplines, or expertise if we are to help define the future direction of the Division. Follow up on this meeting took place the next two SELT meetings with the final preparation of a set of ideas to foster future growth in the Division. This set was assembled by a group of interested TSMs from EES-2, EES-6, EES-9, and EES-11. We (SELT) presented these ideas in an unfiltered format to the attendees of the Division Retreat. This list has been circulated to the DLT and program managers to help forward the TSM viewpoint of our Division capabilities.

EES Awards

Meet Monty Apple Outstanding Service Award Winner

The Tropical Western Pacific Office (TWP) presented the 2003 Outstanding Service Award to Monty Apple of EES-2. The Service Award was established in 2000, and is given each year to a member of the TWP team to recognize his or her exceptional contribution to TWP operations. Previous TWP Outstanding Service Award Winners have included:

- *2000 – Francis Anuma, Papua New Guinea*
- *2001 – Nicholas Duburiya, Nauru*
- *2002 – Kevin Luana, Papua New Guinea*

Monty joined the TWP team as electromechanical technician in July 1995; he played an integral role in the installation and operations of three climate research facilities in the Tropical Western Pacific region. He was initially involved in the establishment of the first two TWP facilities in Manus (Papua New Guinea) and Nauru (Republic of Nauru), CAD drafting, procurement, and planning for the Nauru 99 intensive research campaign.

Apple's responsibilities grew steadily, eventually making him Assistant Operations Manager for Logistics in 2000. Today, he manages maintenance schedules, coordinates shipping, and handles the procurement and logistics for all three TWP facilities.

"This is the best group of people I've ever worked with," Apple said of his fellow TWP team members, which includes foreign governments and locally hired technicians at each facility. "I've always appreciated the diversity of the people involved in the TWP operations," he added.

Congratulations: Tropical Western Pacific Team, EES-2

Distinguished Performance Award Winners

The staff of the Tropical Western Pacific (TWP) Project has been awarded a Large Team Distinguished Performance Award. This team is part of the United States Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Program, a national program of great importance to understanding and predicting global climate. The ARM program is central to the US Climate change research program portfolio, and thus, the

TWP team is an integral part of DOE's effort to address a major political and technical problem that has large impacts at the national and international levels, bringing distinction to Los Alamos National Laboratory. The overall goal of the DOE ARM Program is to improve the predictive capabilities of General Circulation Models (GCMs) by improving the treatment of radiative transfer and the parameterization of cloud properties and cloud formation used in those GCMs. The central infrastructure of the ARM program depends on implementation and operation of three permanent climate-monitoring stations to supply long-term continuous and high quality data to support the model developments. One of these sites, the Tropical Western Pacific is directed out of the TWP Project Office at Los Alamos National Laboratory. Since 1992, the TWP team has developed and operated Atmospheric Radiation and Cloud Stations (ARCS) in remote locations in Papua New Guinea (PNG) and the Republic of Nauru. Recently, Los Alamos' TWP team led an international collaboration of scientists and technicians in installing a third ARCS in Darwin, Australia that began collecting data on April 1, 2002. The management plan had significant risks. The contracting process, the site approval, and the construction of the new maintenance center all needed to stay on schedule to ensure success of the TWP program at PNG and Nauru as well as Darwin.

The Distinguished Performance Award for the ARM Tropical Western Pacific team recognizes the team's direct and significant contribution to the success of the DOE climate change research program. The team has truly excelled in their performance of the broad spectrum of scientific, engineering, technical, administrative, and management activities needed to achieve ambitious near-term goals while maintaining their operational objectives and reducing overall costs. **The TWP team is an excellent example of what a highly diverse and dedicated team, from widely ranging backgrounds can accomplish when motivated by a clear goal of improving the understanding of the world we live in.**

For more information about the TWP operations (an operational project team in EES-2), visit us @ www.twppo.lanl.gov.

Congratulations:

Tom Sandoval & Rod Whitaker

Distinguished Performance Award Winners

Tom Sandoval and Rod Whitaker, EES-2, were recently notified that their participation in the WATUSI Experiment Team recognized them as recipients of a Large Team Award for a Distinguished Performance Award.

The Laboratory's Watusi Experiment Team's goal was to demonstrate that US national security depends on our ability to accurately detect and verify seismic and infrasound events (ground based monitoring). The purpose of ground based monitoring of nuclear explosions, places an emphasis on our need to distinguish between naturally occurring and man-made events. This experiment, conducted at the Nevada Test Site, involved a 38,000-lb explosive shot (TNT equivalent) that was used to characterize new infrasound sensors, including a novel superconducting sensor, and to compare new sensor performance with existing infrasound and seismic diagnostics for detection of low-end seismic events and nuclear tests. The successful conduct of the Watusi experiment demonstrated a characteristic that is more essential than ever

for our Nation-that of cooperation and partnership amongst multiple agencies to carry out a large, complex and hazardous task in a timely, and cost-effective manner. Thanks to the Watusi Team, the Laboratory was successful in planning, leading, and executing this extraordinary endeavor under a very short deadline. The level of work performed on this project is a demonstration of the highest standards of science and engineering at the Laboratory.

The Watusi Team has brought Laboratory credit and visibility to DOE, NNSA and other governmental agencies. The successful completion of this experiment positions the U.S. and the NTS favorably, should nuclear testing need to be resumed. In addition, the reputation of the Laboratory was significantly enhanced within the Intelligence Community by the successful completion of this experiment.

Watusi information provided by David J. Funk, DX-2

GISLab Receives LAAP/CAP Awards:

The GISLab Team, a team in the Environmental Geology and Risk Assessment Group (EES-9), was recognized for their "outstanding contribution to enterprise GIS (EGIS) design and Los Alamos institutional GIS, that far exceeds expectations for Los Alamos projects and operations." GISLab team members Marc Witkowski, Thomas Riggs, Randy Mynard, and Gordon Keating received Los Alamos Awards Program (LAAP) awards, and Doug Walther and Rick Kelley received Contractor Awards Program (CAP) awards.

Specific Contributions of GIS Team Members and Publications include the following:

1) Documentation of events and lessons learned, consensus building, and challenges for EGIS at LANL:

- *Gordon Keating et al. 2002. Challenges for EGIS in post-wildfire hazard mitigation. LANL LA-13930.*
- *Randall Mynard, Keating, Rich, Bleakly. 2003. GIS emergency support for the Cerro Grande Wildfire... LANL LA-14007-MS.*
- *Gordon Keating, Rich, Witkowski. 2003. Challenges for enterprise GIS. LA-UR-02-1830. URISA Journal 15(2). In press.*

2) Development of theoretical basis and implementation of prototype EGIS:

- *Marc Witkowski, Rich, Keating. 2002. Spatial data warehouse design for enterprise GIS. GIScience. LA-UR- 02-3514.*
- *Marc Witkowski, Rich, Keating. 2003. A Prototype for Enterprise GIS. LANL LA-14027.*
- *Marc Witkowski, Rich, Keating. 2003. Enterprise GIS Design. International Journal of GIS. LA-UR-03-1688. In review.*

3) Initiation and participation in LANL GIS Technical Steering Committee.

4) Growing national and international recognition for EGIS work.

GISLab detailed a five-step methodology for implementation of EGIS: 1) design specification; 2) data resource evaluation; 3) spatial data warehouse design; 4) physical system architecture design; and 5) implementation. This five-step process was effective in the implementation of the Cerro Grande Rehabilitation Project (CGRP) GIS.

The CGRP GIS technical design uses the spatial data warehouse design concepts and custom enterprise tools for data and work

tracking, together with a data policy and standard procedures of data and work flow,

to achieve a complete geospatial data cycle. The result is an EGIS design with broad applicability.

GISLab Team Leader Paul Rich commented. "I am honored to work with such a talented and dedicated GIS team."

Weekly Highlights / Accomplishments sent to ADSR

Los Alamos Geoscientist Awarded Carnegie Museum's Mineralogical Award

The July-August 2003 Mineralogical Record congratulated and featured Dr. Terry C. Wallace, Jr. for receiving the Carnegie Museum of Natural History 2002 Carnegie Mineralogical Award. The award was presented in February 2003. Wallace is the Acting Division Leader of Los Alamos' Earth and Environmental Sciences Division. At the time of the award, Dr. Wallace was a professor of Geosciences and Curator of the University of Arizona Mineral Museum and he is considered "**the foremost expert on silver and silver minerals in the United States**". Dr. Wallace specializes in forensic seismology and monitoring of underground explosions. His expertise contributes greatly to some of the major capabilities in the Laboratory's Earth and Environmental Sciences Division, which he now leads.

Carbon Sequestration Team Awarded Research Funds

A team of researchers from Chemistry Division, Computational and Computing Sciences Division, Earth and Environmental Sciences Division, Theoretical Division, Decision Applications Division, Los Alamos Neutron Scattering Center, researchers in academia recently received notification of funding by the Department of Energy's Laboratory Directed Research and Development (LDRD) for their emerging research on carbon sequestration. Los Alamos' researchers are: Dongxiao Zhang, Project Leader, Bill Carey, Michael Hall, David Higdon, William Hollis, John Kaszuba, Peter Lichtner, Rajesh Pawar, and Ysheng Zhao. External collaborators are: Shiyi Chen, Johns Hopkins University, Reid Grigg, New Mexico Technological University, and Charles Lesher, University of California, Davis. The team's research on fundamental issues of long-term geological carbon sequestration, **will put Los Alamos at the forefront of geological carbon sequestration science/engineering and in a unique and advantageous position to develop future major programs in this area.**

NNSA's Greenaugh Briefed by LANL on Target Defeat

Wendee Brunish, Earth and Environmental Sciences, Earl Knight, and David Steedman, Decisions Applications, briefed Kevin Greenaugh, National Nuclear Security Administration (NNSA), on the Hard and Deeply Buried Target Defeat (HDBTD) Advanced Concept Technology Demonstration (ACTD). The United States Strategic Command and the Defense Threat Reduction Agency jointly fund the ACTD. Greenaugh is the NNSA representative to the ACTD executive management committee. The goal of the ACTD is to **reduce targeting uncertainties and provide an improved understanding of the dominant phenomenologies for ground shock and tunnel response in a hard, jointed-layered geology.**

Australia, Japan, and Patrick Burns Tour Yucca Mountain

Bruce Reinert, Earth and Environmental Sciences' Yucca Mountain Project, conducted a tour on August 4 for Members of the Australian Parliament/U.S. Congressional Staff that

included Jeannie Ferris, Senator for South Australia, Government Whip, Joan Hall, Senator for South Australia, and Shannon von Felden, Legislative Aid, Office of Congresswoman Shelley Berkley.

On August 6 a tour was conducted for delegations from Japan that included Hiroyuki Yamaya, Cabinet Office for National Security and Crisis Management, and Mamoru Shinohara, Ministry of Foreign Affairs. Representatives from Japan for the following organizations also attended: Japanese Ministry of Economics, Trade, and Industry; the Ministry of Education, Culture, Sports, Science, and Technology; Japanese Nuclear Cycle Development Institute; Nuclear Safety Technology Center; Nuclear Safety Commission; and the Nuclear Emergency Assistance and Training. Reinert conducted a tour on August 7 for Patrick Burns, Director of the White House Critical Infrastructure Protection.

Bradley and Carney Recommend Rock Mechanics Course

Chris Bradley, Ted Carney, both of the Geophysics Group, and Earl Knight, Decision Applications Division, attended the American Rock Mechanics Association (ARMA) short course Rock Mechanics for Practitioners that was held in Boulder, CO, August 4-8. The course emphasized the influence of discontinuities and scale on rock-mass behavior and provided empirical means for including these effects in analysis. Techniques for in-situ measurements of deformation and stress were presented, as were procedures for analysis of rock mass stability. Chris and Ted recommend this course to their EES colleagues without reservation. See either Chris or Ted for further information and an ARMA contact for next year's course schedule.

Los Alamos' Tropical Western Pacific Office Honors Monty Apple

The Tropical Western Pacific Office (TWPO) of Los Alamos' Earth and Environmental Sciences Division (EES) presented the 2003 Outstanding Service Award to Monty Apple of EES's Atmospheric, Climate, and Environmental Dynamics Group. Apple played an integral role in the installation and operations of three climate research facilities in the TWP region. The award was established in 2000 and is given each year to a member of the TWP team to recognize his or her exceptional contribution to TWP operations. Previous TWP Outstanding Service Award Winners were from Papua New Guinea and Nauru. The Tropical Western Pacific Office is a component of the U.S. Department of Energy's Atmospheric Radiation Measurement (ARM) Program. TWPO operates three climate research facilities in the tropical western Pacific region: Manus, Papua New Guinea; Nauru, Republic of Nauru; and Darwin, Australia. For more information about the ARM Program, visit its website at www.arm.gov. For more information about the TWP operations, visit www.twppo.lanl.gov.

Yucca Mountain Begins Voluntary Protection Program for STAR Site

On August 11, Bechtel Science Applications International Corporation (BSC) began the Voluntary Protection Program (VPP) on-site review process at Yucca Mountain (YMP). The introductory meeting was a kick-off to validate the project's safety program. If found to be "Outstanding", the review team will recommend to the Secretary of Energy that the site be designated an Office of Safety and Health Administration (OSHA) VPP "Star" site. The VPP team consists of five representatives from the DOE complex.

The Los Alamos Test Coordination Office (TCO) in the Earth and Environmental Sci-

ences Division's YMP office provided the services and demonstrations to the VPP team. The TCO's Environment, Safety and Health Specialist, Mike Taylor, a Field-Test Representative and a long-term, senior member of the YMP Mine Rescue Team, provided a Mine Rescue Booth, demonstrated various types of mine rescue equipment, including Closed Circuit Self Contained Breathing Apparatus (CCSCBA), First Aid Equipment and Supplies, and atmospheric testing equipment, including Direct Reading Gas Testing Instruments. Mr. Taylor was interviewed by the VPP at length and was requested to provide detailed explanations of mine rescue procedures, equipment, and supplies. **This introductory meeting and presentation is important to the entire YMP in achieving OSHA VPP "Star Status".**

Tooele County, Utah, Nuclear Energy Institute, and Congress Members Tour Yucca Mountain

Congressman Gresham Barrett (R-SC) and his staff were toured on August 7 by Richard Kovach, Earth and Environmental Sciences Division's Yucca Mountain Project and they included: Lance Williams, Chief of Staff; J.W. Raglin, Legislative Assistant on Energy; and Darrell Brown, District Director. Bob Pedde, President, Washington International Group, Savannah River, also attended the tour. The visitors toured Alcove 2, which is an underground excavation off the main tunnel and it has been customized especially for tours, including maps/displays; it is about 160 meters (200 yards) underground. The visitors also toured an area 2,800 meters into the tunnel to observe an ongoing experiment that simulates the heat generated from waste canisters and its affect on the surrounding geology.

Bruce Reinert, of the Earth and Environmental Sciences Division's Yucca Mountain Project, toured Commissioners from Tooele County, Utah on August 8 and the visitors included: Myron Bateman, Health Office; Harry Shinton, Hazardous Materials Planner; Richard Lakin, Emergency Coordinator; Matthew Lawrence, Commissioner; Dennis Rockwell, Commissioner/ Chairman; Gene White, Commissioner; David Michaelson, Hazard / CIS Analyst; Jeff Coombs, Environmental Health Director; and Wade Mathews, Public Information Officer.

Congressional staffers from the Nuclear Energy Institute received a tour from Reinert on August 13 and they included: Clint Williamson, Director of Legislative Programs; Marsha Shasteen, Minority Staff Counsel; Kristofer Baumgartner, Legislative Assistant; Leslie Huddleston, Regional Director Legislative Assistant; Colleen Deegan, Strategic Planning & Program Integration, Bechtel Science Applications International Corporation. Tours at YMP include a general briefing of the tunnel layout and experiments (both completed and ongoing). This occurs underground in an excavation off the main tunnel called an Alcove.

Los Alamos Selected as Co-PI on Two Regional Partnerships for Carbon

The National Energy Technology Laboratory announced the partnerships that are selected for assessing how to close the carbon cycle (e.g., via sequestration) in various regions in the US (www.netl.doe.gov).

DOE's strategy for addressing the President's FutureGen initiative relies heavily on these partnerships for developing region-specific strategies for carbon sequestration. (**FutureGen is a $1B initiative to build a power plant that produces hydrogen from coal while sequestering the carbon dioxide.)**

Los Alamos was a major contributor and partner in two of these regions (out of seven total successful partnerships). National Laboratories were excluded from leading partnerships;

therefore, Los Alamos teamed with strategic partners in the two regions that related to our sequestration activities.

One of the partnerships was led by Montana State University and is focused on developing a sequestration strategy for the region that includes Idaho, Montana, and part of Wyoming, the Dakotas, and Minnesota. Richard Benson, Chemistry Division, led a team of Los Alamos Principal Investigators who contributed to the partnership in areas that include terrestrial and geologic sequestration and monitoring/measurement systems.

Another partnership was led by New Mexico Tech and is focused on developing a sequestration strategy for the region that includes part of Arizona, Utah, New Mexico, and part of Wyoming, Kansas, Oklahoma and Texas. Craig Pearson, Earth and Environmental Sciences Division (EES), led a team of Los Alamos Principal Investigators that contributed to this partnership in areas that include terrestrial and geologic sequestration, carbon dioxide mineralization, and carbon dioxide capture and separation. Other technical contributors from EES included Peter Lichtner, Paul Rich, Marc Witkowski, and Hans Joachim Ziock, Manvendra Dubey, Michael Ebinger, George Guthrie, and Rajesh Pawar.

Earth and Environmental Sciences Division (EES) Ready to Contribute to Healthy Forest Initiative

A recent Oregon State University (OSU) press release features Earth and Environmental Scientist Dr. Nathan McDowell's graduate research work. Dr. McDowell is continuing his research at Los Alamos on forest thinning as part of his Director's Postdoctoral Fellowship. Dr. McDowell's work has been the first to demonstrate that "even old growth forests experience a positive growth and photosynthesis response following thinning. Dr. McDowell, Los Alamos scientists, and their collaborators examined the ratio of different "isotopes" of carbon in annual tree rings, which provided them with an index of water stress and photosynthesis over the past 20 years, including before and after mechanical thinning. "A tree grows by consuming carbon through the process of photosynthesis, during which they take in two types of carbon, the isotopes carbon 12 and carbon 13, through holes in the needles called stomates," said Nate McDowell, a former OSU graduate student and lead author on this study. "Trees take in differing amounts of these two types of carbon depending on the degree of water stress they are experiencing." The release also states, "By studying the ratio of these two isotopes in the annual tree rings, we can tell when and if water stress was alleviated by thinning, even before any increase in wood growth occurs," McDowell added. "It appears that trees may have a lag time of several years in their stem growth after water availability and subsequent photosynthesis have improved. This indicates that growth may be taking place elsewhere in the plant, such as in the roots or canopy." Regarding the research, Dr. Jeffrey Heikoop, McDowell's mentor stated, "Researchers in EES are now poised to address the President's Healthy Forest Initiative, an issue that will be with the west for some time to come." http://oregonstate.edu/dept/ncs/newsarch/2003/Aug03/thinning2.htm

Environmental Management Science Program Awards Los Alamos and Pacific Northwest National Laboratory Project

Dr. Peter Lichtner of the Earth and Environmental Sciences Division and John Zachara at Pacific Northwest National Laboratory received funding for a new Environmental Management Science Program project titled: "Mineralogic Residence and Desorption Rates of Sorbed 90Sr in Contaminated Subsurface Sediments: Implications to Future Behavior and In-ground Stability." Funding for the

project is $100,000 a year for optimally three years. Additional information is available at:

http://www.netl.doe.gov/publications/press/2003tl_sequestration_partnershipselections.html

http://www3.fossil.energy.gov/programs/sequestration/partnerships/2003sel_southwest.html

http://www3.fossil.energy.gov/programs/sequestration/partnerships/2003sel_nrockies.html

New Mexico (NM) Symposium of Hydrologic Modeling, August 12, 2003

A number of scientists and staff from the Earth and Environmental Sciences Division attended the NM Symposium on Hydrologic Modeling on August 12 in Socorro, NM. NM State University, NM Tech, University of New Mexico, Los Alamos National Laboratory, Sandia National Laboratory, USGS, NM Office of the State Engineer, NM Interstate Stream Commission, and the American Water Resources Association - New Mexico Section, sponsor the annual meeting on Water Resources Research.

The meeting was very well attended with 140 attendees from New Mexico, Colorado, Texas, and Arizona. Presentations by Los Alamos personnel included:

1.The Importance of Considering Groundwater Quality in Defining Sustainable Use: A Case Study Using 3-D Flow and Transport Models to Assess Water Resources in Northern New Mexico – Elizabeth Keating and Velimir Vesselinov;

2.Groundwater Path Analysis for the Pajarito Plateau - Kay Birdsell, Velimir Vessel Brent Newman, Marc Witkowski, Diana Hollis;

3.Los Alamos National Laboratory Low-Head Weir: Challenges in Modeling Bromide Transport through an Unsaturated Fractured Basalt – Philip Stauffer, William Stone, Dennis Newell, David Wykoff, Daniel Levitt;

4. Aqueous Geochemistry of Uranium, Los Alamos and Surrounding Areas, New Mexico – Patrick Longmire, Dale Counce; and

5. Marja Springer, who serves on the organizing committee for the yearly meetings, gave a short introduction on behalf of the Laboratory and moderated the Flowpath Analysis and Contaminant Transport session.

Los Alamos' Atmospheric Isotope Research Helps Fuel Cell Technology

Dr. Thom Rahn, a Frederick Reines Postdoctoral Fellow in the Earth and Environmental Sciences Division at Los Alamos National Laboratory, and his colleagues have shown that deuterium, a naturally occurring stable isotope of hydrogen, concentrates itself in molecular hydrogen (H2) in a key layer of the atmosphere. The finding lends important insight into the natural cycle of molecular hydrogen and could have ramifications for the use of fuel cells as an alternative energy source. The findings indicate that molecular hydrogen in the atmosphere tends to accumulate deuterium in the stratosphere, the second layer of Earth's atmosphere located approximately 10 miles above the surface. The stratosphere is home to Earth's ozone layer, which stops potentially lethal amounts of ultraviolet radiation from reaching Earth's surface.

The journal *Nature* published the research on August 21 and features Rahn's findings and the research of his collaborators from the California Institute of Technology, the University of California at Berkeley, the University of California at Irvine, and the National Center for Atmospheric Research in Boulder, Colorado.

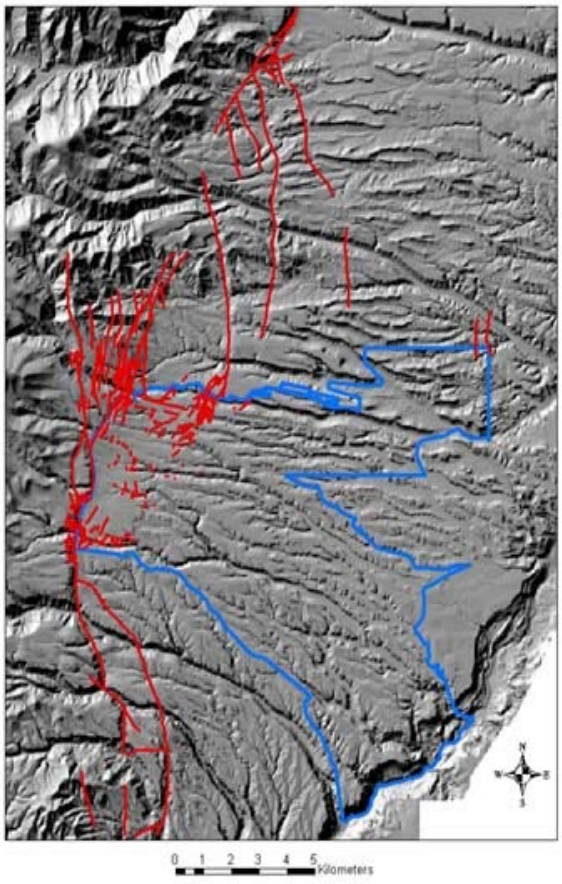
http://www.lanl.gov/worldview/news/releases/archive/03-113.shtml

WIPP's Mobile Loading Unit Makes House calls

It's a big job cleaning up our nation's transuranic (TRU) waste. Joint efforts by Los Alamos National Laboratory-Carlsbad Operations Office in the Earth and Environmental Sciences Division and Washington TRU Solutions have simplified the task. The two organizations worked together to assemble a nationally certified team that travels with three Mobile Loading Units (MLU) to make "house calls" to DOE facilities where TRU waste are temporarily stored. Once waste has been characterized, a highly skilled team uses standardized procedures and portable MLU equipment to safely and cost-effectively certify, load and ship as many as five shipments of TRU waste to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico per week. The team is particularly cost effective at "small quantity sites", so called because they have small TRU waste inventories and little or no infrastructure to certify and load waste for shipment. WIPP is currently permitted to accept only Contact-Handled (CH) TRU-waste, which by simple definition, is material/waste that exhibits activity of >100 nanocuries/gram, and has a dose rate of <200mrem on contact.

1st Place: Emily Schultz, EES-9
2nd Place: Jim Craig, EES-7
3rd Place: Frank Perry, EES-9

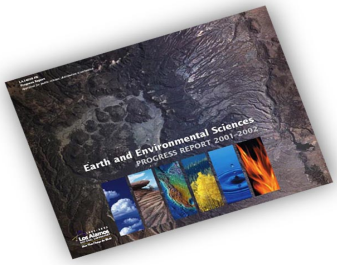
According to Emily Schultz, "The mystery image from July shows the western boundary of the Rio Grande Rift, which is the Pajarito Fault Zone." Emily is a student in EES-9; she's been at Los Alamos since January 02 and will be here through December of this year working on the Seismic Hazards Team with Jamie Gardner (her mentor), Alexis Lavine, and Claudia Lewis. Emily is helping to create a digital map of the Pajarito Fault Escarpment just west of the Laboratory. Emily stated, "I'm intimately familiar with images that look just like the one in the July EES newsletter!"



Winner of the July Mystery Image:
It was the Rio Grande Rift! (above right)

Jim Craig and Frank Perry were also correct in identifying this as the Jemez. Thanks for participating!

Read more in the EES 2001 - 2002 Progress Report, page 54 (Geological Elements of the Laboratory's Seismic Hazards Program) or @



http://www.ees.lanl.gov/pr/index.shtml

Dottie's Mystery Image for August: what is the name of this instrument?

Is this instrument

- Ecological Radiation Counting Vessel?
- Portable LIDAR?
- Infrasonic Chamber?

Respond to: dot@lanl.gov

EEScience

Guest Editorial

FIRETEC

An R & D 100 Award Winner

Rod Linn, EES-2
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Wildfire Modeling at Los Alamos

Background

Historically, frequent, low-intensity fires were beneficial phenomena in wildland environments, clearing away excessive growth and regulating the competition for finite space and water. But a century of fire suppression left our forests choked with fuel that was dried to tinder by years of drought. Now when fire occurs, it is catastrophic, as evidenced by the monumental wildfires that in the past few years have destroyed resources and property in the western states and even in Florida.

Planning effective mitigation strategies (for example, thinning overgrown areas and setting controlled burns) to rebalance the environment and reduce the number of disastrous wildfires requires a clear understanding of how fire behaves in response to rugged terrain, variable winds, and mixed (heterogeneous) vegetation. However, current operational fire-simulation computer models are limited by being empirically based—they rely on extrapolations from a limited set of laboratory and field-scale experiments that estimate fire

behavior in response to set conditions in a single location. These models are not suitable for predicting strong fire behavior in rugged topography or in complex vegetation or atmospheric situations. They cannot provide explanations of the critical relationships between physical processes in a fire. What is needed today is a representation of the physics of wildfire so that the details of its behavior can be modeled through all of the dynamic conditions that accompany it as it moves through a complex landscape.

HIGRAD/FIRETEC

In 1995, the development of FIRETEC began as a small piece of a crisis forecasting initiative that was started by Andrew White, who was the Director of Los Alamos' Advanced Computing Laboratory. Wildfire was chosen as one of several "crises" of focus. In 1997 FIRETEC was linked to HIGRAD, a high fidelity atmospheric model being developed by researcher Jon Reisner at Los Alamos. Since 1995, the vision of what FIRETEC should be went through several evolutions. Initially, most people (including those researchers involved in the Los Alamos wildfire modeling effort) thought that the purpose of a wildfire model is to produce faster than real time predictions. After initial modeling efforts with FIRETEC and other atmospheric models such as RAMS and HIGRAD, it became clear that this would not be a near-term practical application of the tools Los Alamos was developing because of their computational requirements and the availability of input data such as vegetation.

New directions were suggested by members of the Los Angeles County Fire Department including, urban planning and training. These suggestions led to a range of other notions of what a detailed-wildfire behavior model would be good for if it could not run faster than real time. Some of the other potential applications that have been considered are risk assessment, evaluation of emergency response plans, development of controlled burn prescriptions, assessment of thinning strategies, developing an understanding of the complex relationship between the environment and fire, and being used as a tool for further development of the fast running models that are used during the wildfires. With these types of applications in mind, the work on HIGRAD/FIRETEC continues to evolve.

Where does HIGRAD/FIRETEC Fit in Today?

FIRETEC is the first physics-based, three-dimensional (3-D) computer code designed to simulate the constantly changing, interactive relationship between fire and its environment. It does so by representing the coupled interaction between fire, fuels, atmosphere, and topography on a landscape scale (hundreds or thousands of meters). FIRETEC combines physics models that represent combustion, heat transfer, aerodynamic drag, and turbulence with a computational fluid-dynamics model, HIGRAD, which represents airflow and its adjustments to terrain, different types of fuel (vegetation), and the fire itself. Unlike the empirically based models currently used in the field, FIRETEC simulates the dynamic processes that occur within a fire and the way those processes feed off and alter each other.

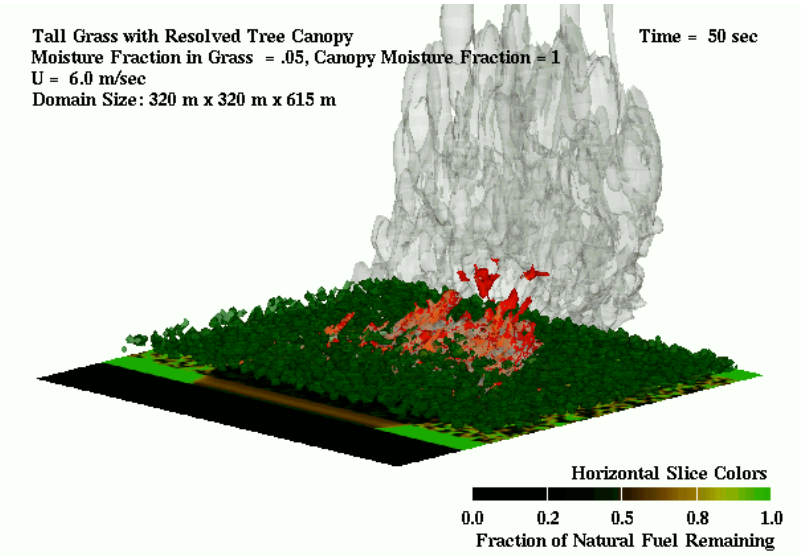
For example, during a FIRETEC wildfire simulation, heat is produced, fuel and oxygen are reduced, and the surrounding air becomes buoyant, causing hot air to rise quickly above the fire and draw cooler air in near the base of the fire. Heat is exchanged between fuel and gases as air moves through plants, and thermal radiation is given off from hot gases and burning vegetation. In addition, vegetation imposes aerodynamic drag on the airflow in relation to the bulk properties of the fuel bed.

FIRETEC simulates the dynamic processes that occur within a fire and the way these processes feed off and alter each other. The model

works by solving a set of coupled partial differential equations (PDEs) for the conservation of mass, momentum, energy, chemical species, and turbulence. These equations describe the evolution in time and the variations in space of many physical properties that influence or are influenced by a fire—gas and vegetation temperatures, wind speed and directions, kinetic energy in the form of turbulence, oxygen concentrations, masses and characteristics of remaining vegetation, and other variables. These physical properties are computed as functions of time at millions of locations distributed in a three-dimensional mesh that follows the simulated landscape.

The PDEs generate values for these physical properties at discrete physical locations often spaced at intervals of 2–10 meters horizontally and 1–6 meters vertically near the ground (larger vertical intervals high above the ground). Computed values at these points ("resolved values") represent the average property for the surrounding volume. Variations from these averages ("unresolved fluctuations") occur in all the variables, for example, in the temperatures and density of adjacent fine-scale hotter and cooler gas pockets, the velocity fluctuations in turbulence, and the close proximity of oxygen-rich to oxygen-poor regions.

FIRETEC accounts for the combined effects of some of these unresolved fluctuations by using probability distribution functions (PDFs) and stochastic methods (correlations between fluctuations in variables). For example, using a PDF to describe temperature variations in the vicinity of a resolved average temperature allows FIRETEC to better estimate how much of the vegetation is hot enough to burn and how much heat will be released by thermal radiation. Stochastic methods are also used to represent the strength and impact of turbulent velocity fluctuations in terms of turbulent kinetic energy. Turbulent kinetic energy is then used to influence the calculations of the mean velocity patterns and the rate of combustion.



By embedding this physics-based model, formulated in terms of PDEs, in a terrain-following coordinate system, FIRETEC is able to represent interactions between ambient winds, rugged topography, and fire (see Figure 1).

Figure 1: FIRETEC simulation of a fire that is carried by the wind from a region with no fuel (black area which could be a road or blackline) across a grassland and then under a forest canopy. The trees in this forest canopy are representative of those near Flagstaff, AZ. The understory density variation is correlated to the shade and litter areas caused by the trees.

FIRETEC can be tailored to investigate facets of wildfire behavior associated with a wide range of environmental influences, from the local effects of specific tree configurations to the large-scale effects of evolving weather conditions.

FIRETEC's realistic modeling of the interactions between fire, terrain, and atmospheric conditions provides essential, science-based information that enables fire managers to formulate effective defensive strategies and avoid catastrophic accidents. We envision FIRETEC to be a tool that could help understand the following:

- *Fundamental processes that control the transition from ground fires to crown fires (fires that burn from treetop to treetop) and the conditions that allow fire to sustain itself in the forest canopy.*
- *The environmental thresholds that cause drastic changes in wildfire behavior.*
- *The conditions that deceive fire fighters and can become deadly traps.*
- *The relationship between fire, fuel, and atmospheric conditions that controls a fire's ability to spread through long-range lofting, or "spotting," of burning materials.*
- *How wildfires behave in rugged topography under different atmospheric conditions, including those that cause a fire to "blow up" a steep canyon, stop at a ridgeline, or jump from one side of a canyon to another.*
- *How frequent variations in wind conditions, including changes in speed, direction, and the frequency of gusts, affect the way fires spread.*
- *The interaction between multiple fire fronts.*
- *The influence of barriers (for example, lone trees or rock outcroppings) that cause interruptions in wind fields.*
- *How fire propagates up and down steep slopes, and how flames attach to hills (a phenomenon in which flames are sucked down close to the ground on steep slopes).*

The USDA Forest Service has begun collaborating with Los Alamos for the purpose of learning how fire interacts with various fuels and fuel structures. Together we are beginning to investigate how fire responds to fuel beds (that is, how fire behaves in areas such as forests) after they have been treated with different fuel-thinning strategies. We would like to be able to show fuel managers the varying effects of (1) making specific changes in the structure of a stand of trees, such as leaving a full canopy of trees, leaving clumps of trees, or leaving sparse, single trees; (2) changing the amount of fuel available by logging or thinning trees; and (3) reducing understory vegetation by burning or thinning.

At Los Alamos we are also focusing on ways to use our tools to improve faster running models that are used during fires. To this end, FIRETEC is capable of determining the conditions under which errors are likely to occur in the results obtained from the existing empirical models and what important wildfire processes these fast-running models are not able to represent. Once these conditions and processes are identified, FIRETEC can be used to perform virtual experiments that will illustrate the type of dependencies and relationships that should be added to the fast-running models.

It is our hope that FIRETEC will someday allow decision-makers to understand how wildland fires behave. It could help them choose the right mitigation strategies for reducing the number of disastrous fires and improving an ecosystem's ability to survive. FIRETEC is the tool that can lead to better land-management practices and to reduced loss of life, property, and natural resources.

About FIRETEC's R&D 100 Award

FIRETEC Code Wins R & D 100 Award

FIRETEC, represented by researchers, in the Earth and Environmental Sciences Division, Computer and Computational Sciences Division, Theoretical Division, and the United States Forest Service was awarded one of the

eight Los Alamos R&D 100 Magazine 2003 awards.

FIRETEC is a Physics-Based Wildfire Model and is a three-dimensional (3-D) computer code designed to simulate the constantly changing, interactive relationship between wildfire and the environment. It simulates the dynamic processes that occur within a fire and the way those processes feed off and alter each other.

Los Alamos received more awards than any other Department of Energy laboratory. In recognizing the achievement, Interim Laboratory Director G. Peter Nanos noted that "many of these award-winning technical innovations were born out of Los Alamos' mission to create science that serves society. This is evidence to the fact that Los Alamos remains home to some of the best science and brightest scientific minds in the world. These innovations are the result of our pursuit of ideas that change the world."

EES Highlight from July 16, 2003.

News, Views & EEScience:

A Monthly Newsletter from

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